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Sustainable Livelihood Security as an important factor for Food Security in the Context of Extreme Flood Events

Abstract

Pacific Island countries are spread over a vast area of the Pacific Ocean, occupying an area over 30 million km2. Smallness, remoteness and vulnerability are the major problems affecting the 22 Pacific Island Countries and Territories. The Pacific Island countries are particularly vulnerable to the impacts of global warming. Among other issues they are exposed to more intense natural hazards, such as tropical cyclones, extreme flood events, and droughts that easily can lead to disasters. In a recent report, the UN Food and Agriculture Organization alerted that such disasters can severely reduce food production in Pacific island nations and called for urgent measures to adapt to expected losses (FAO, 2008). In Social Science ideas about vulnerability to natural disasters have emerged in the past three decades following Amartya Sen's publication on famine (Sen 1981) and Robert Chambers publications on social vulnerability thereafter (Chambers, 1989). To adjust, adapt to cope or if necessary to recover from adverse events is a big challenge in Pacific Island Countries. Likewise, there is an urgent need to integrate climate change adaptation and

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disaster risk management / reduction into national policies, strategies, programs and budgets.

This paper looks into the patterns of livelihood and food security and how it is affected by extreme flood events in Nadi, a tourist town in western Viti Levu of Fiji Islands. The question is if emigrations/ resettlement in particular cases are feasible options, e.g. for places like Nadi or even whole nations such as Kiribati or Tuvalu.

This paper is a small summary of my PhD project's pilot case study area, Nadi in Fiji Islands. The aim of the paper is to show systematically, how vulnerable can Nadi Area become during and after an extreme flood event. The final PhD thesis research question is to analysing extreme flood events and their impacts on livelihood and food security in Nadi area in Fiji.

Keywords*:* Climate change, extreme flood events, sustainable livelihood, livelihood and food security, Nadi Area

Introduction

In a recent report, the UN Food and Agriculture Organization alerted that natural disasters and an increase in global temperature will severely reduce the food production. In Pacific island nations and called for urgent measures to adapt to expected losses (FAO, 2008).

Climate change is a phenomenon which has shaped and will continuing shaping the physiographic and human lives simultaneously. Climate changes bring major environmental problems affecting the most of the low lying Pacific Island Countries and Territories (PICT's), which are already vulnerable to socio-economic and political factors because of the heterogeneous physiographic. As the sea level is rising and the glaciers are melting, through more natural processes rather than anthropogenic processes, the effects are now

being experienced severely in the very low lying countries in the Pacific Ocean. These low lying island countries coastal land and vegetation are nigh to disappearing. Climate change has direct impacts on people's life, food and water and livelihood security. Many scholars have written on climate change a food security separately, however, it is important to concentrate on the connection and correlate the impacts of climate change on food and water security. This paper concentrates on how climate changes especially the extreme events effects and impacts on food and livelihood security and what are the measures and precautions taken and implemented by the governments of the Pacific Island countries to overcome some of the severe environmental hazards such as sea level rise, tropical cyclones, floods and drought and erosion. Moreover, some of the innovative approach implemented by the Island governments is to migrate inland or to larger countries like Australia or New Zealand. However, such migration to neigbouring countries might have negative impacts on the receiving countries. Similarly, inland migration on hill and mountain areas will have negative impacts because re-developing the new landscape as settlements and towns will be costly for the developing island countries.

Pacific Ocean has vast low elevation with an open area; therefore, with high precipitation, erosion and sea level rise, the region´s land areas are exposed to environmentally induced changes continually. This will have a direct implication on food and livelihood security. The impact of climate change has different influence in different Pacific islands because of their different characteristics of land size, land use, population and agriculture. With completely different environmental consequences, different Pacific island countries will require different measures to adjusting, adapting and coping

Extreme events such as flooding represent the most common type of environmental hazard which affects individual's livelihoods than any other of hazards. (Bell 1999). Flood events has no time to choose whom to affect because it can occur almost anywhere and anytime, they affect small and large areas and they can destroy houses, businesses, utilities and livelihoods. Moreover, floods claim around 20,000 lives and adversely affect 20 million individuals worldwide each year (Smith & Petley 2009). Unfortunately, several scientists

agree that climate change is likely to cause shifts in global weather pattern leading to an increase in the frequency of flood events and in their severity (Few 2003). Climate Change promises and brings forth a series of serious and negative impacts on the livelihood, food and agricultural systems in the Pacific Island Region (PIR).

Few days of field work on my own in Nadi Area, I hereby, like to present a paper which shows the context of vulnerability during and after the flood events of Nadi area. The case study was conducted to see how extreme flood events of 2012, 2009, and 1999 might change the household livelihoods. Climate change is a long-term shift in the climate of a specific location, region or planet over two different periods of time. Its effects are higher temperatures, changes in precipitation patterns, rising sea level, increase weather volatility and more frequent weather-related hazards, thence, pose risks for agriculture, food, and water supplies. The World Bank (2010) stated that climate change is expected to hit developing countries the hardest. Pacific Island countries are spread over a vast area of the Pacific Ocean, occupying an area over 30 million km2. Smallness, remoteness and vulnerability are the major problems affecting the Pacific Island Countries. The heterogeneous Pacific Island countries are particularly vulnerable to the effects of climate change and thus are exposed to more frequent natural hazards, such as tropical cyclones, flash floods, and droughts. The impacts of climate change on food and livelihood security is not uniformed because of the characteristics of PICT's, which spans many different ecological, geographic, and meteorological zones. To understand one particular extreme event in the Pacific Island Countries, therefore, a case study was conducted focusing on the extreme flood events of 2012, 2009 and 1999 and how it affects the sustainable livelihood on Nadi Area, Fiji Islands.

Impact of Climate Change on Livelihood and Food Security

Climate change is a major threat to people's livelihoods and food security in the Pacific Island region Climate change threatens those who are already in difficult and vulnerable situation. The fourth Assessment Report of the Intergovernmental Panel on Climate change (IPCC) states that there are likely impacts of climate change on agriculture, livestock and fishing, particularly in tropical and sub-tropical regions, including impacts that render people's livelihoods insecure (IPCC, 2008).

IPCC (2008) also stated that extreme events related with climate change pose a number of problems for water resource managers, including an increased risk of both coastal and inland flooding that threatens people's livelihood, water infrastructure and food systems which will certainly deter food availability, accessibility, utilization and stability.

Similarly, FAO (2008) explains that livelihood security as an important notion to food security means that that if livelihood deters either by natural hazards or by socio-economic scenarios then the food system will be at a risk of getting insecure. According to FAO (2008), food security is not a chronic concern of the Pacific Island countries (PIC). The Pacific Islanders have so far never experienced hunger or starvation for many centuries as they have traditional methods to securing their food as compared to scenarios in parts of South Asia and Africa. Similarly, Barnett (2007) states that traditional methods practiced in Pacific Island countries includes subsistence farming, trading and selling products, fishing, hunting and gathering. However, these traditional livelihood methods are being cursed by urbanizations where Pacific Islanders have made a culture of importing and consuming cheap and poor quality of food. Hence, the traditional method of securing the food is gradually eroding. Sen (1981) explained that famine is not necessarily caused due to shortage of food but due to failure of entitlement. Gregory (2005), states that while climate change is seen as most recent phenomena, individuals and societies are used to adapting to a range of environmental and socio-economic stresses.

FAO (2008) explains that livelihood is considered to be sustainable when a household is able to enhance their living standard combined with their capabilities to adapt to ecological, as well as non-natural stresses of life in maintaining their assets and passing these assets to the next generation. Moreover, it explains that it is not the household which should be able to generate and maintain the means of survival but also be able to demonstrate resilience in the face of external shocks and stresses, capacity to maintain the long term productivity of natural resources, and ability to over short or long term food insecurity.

Nadi Area in Fiji Islands at glance

Nadi town is the third largest conurbation in Fiji. It is located on the western side of the main island of Viti Levu. Nadi is also known as the Jetset town because it has the international airport. Along with sugar cane production, tourism is a mainstay and the backbone of the economy. The Nadi region has a higher concentration of hotels, motels, budget accommodation, night life and famous places like Martintar, Namaka, Sabeto and Votualevu than any other part of Fiji. Set in the middle of the cane field belt, Nadi is constantly on the go and never seems to sleep. However, nature plays a pivotal role in shaping the landscape of Nadi for the last few decades. While Nadi is blessed with physical, human and natural resources than at the same time the nature through its environmental process has no time to regret to wipe and whip the area's livelihood.

The reason why one have chosen western Viti Levu- Nadi Area, because flooding is one of the most widespread natural hazards in the western Viti Levu of Fiji. It poses multiple risks to human livelihoods and yet there has been trivial and puny systematic research work. It is totally adverse situation if compared to the statements made by the IPCC (2008) states that "precipitation intensity and variability have increased over most land areas. This is a result of warmer temperatures intensifying and accelerating the hydrological cycle,

leading to an increase in evaporation that causes an increase in total annual precipitation. However, evidence from climate change models suggests that precipitation events will occur less frequently, resulting in an increase in the number of extreme storm events. Climate models also project a likely increase in the intensity, wind speed, and precipitation associated with tropical cyclones and hurricanes, due to warmer ocean temperature". Whereas for the western Viti Levu, there has been more frequent precipitation and intense storm events which led to severe flooding in the years of 1999, 2009 and in 2012 when analysed to the last severe flood in western Viti Levu in the year 1931 (Table 1). Aside this, one can distinguish four types of flooding in Nadi Area: flooding due to inadequate drainage; flooding from number of small streams within the buildup area; flooding from major Nadi River; coastal flooding.

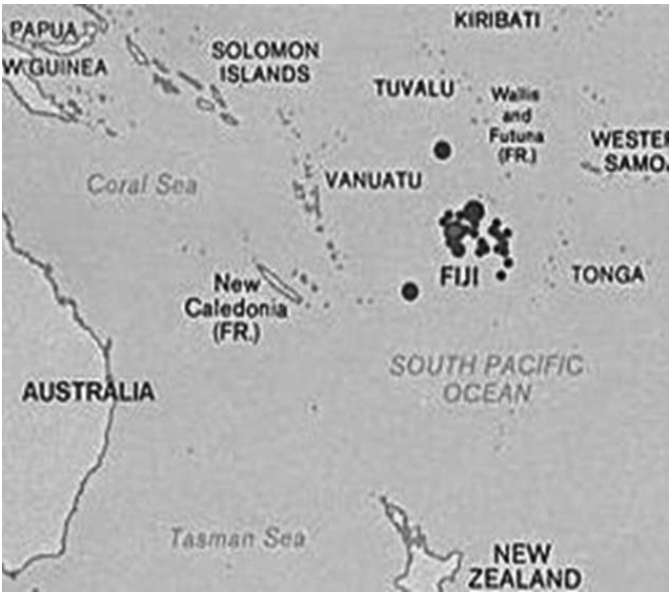


Figure 1: Location of Fiji Islands (Source: http://en.wikipedia.org/wiki/Fiji) Figure 2: Main Islands, Rivers and Towns of Fiji Islands (Source: McGree, S; 2010)

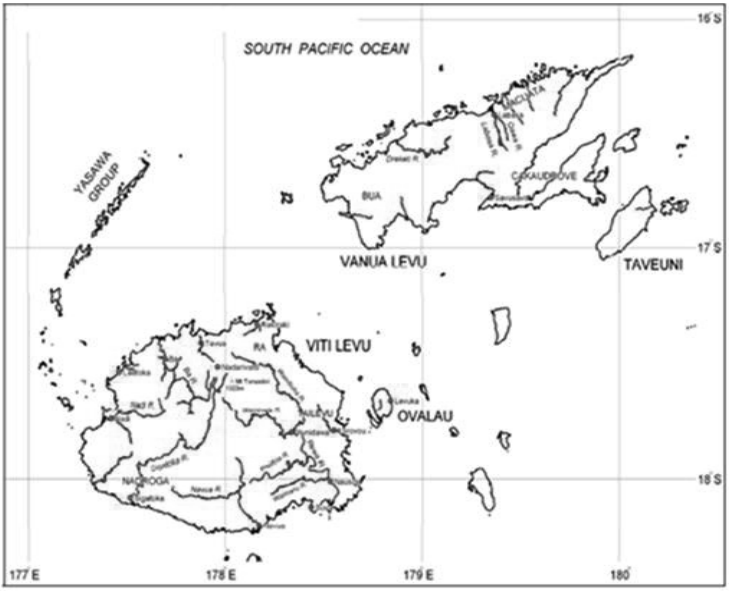


Table 1 Preliminary ranking of known flood peaks for Nadi River at Nadi from 1931-2009

Date	Name	Nadi town		Other	Source	Comment	Rank
		m a.m.s.l.	Source				1 = highest
1931 Feb		?		Floods reportedly the highest and severest ever experienced in Nadi to that date; 5 ft (1.5m) deep in town, in some instances up to 9 ft deep (2.7m); Nadi River rose 35 ft (10.7m) above normal level	FNA, FTs	Description of river rise sounds too high given other levels.	?
1939 Jan		*6.77?*		4 ft (1.2m) deep in shops and houses.	FTs	Est. ½ ft (0.15m) lower than Oct 1972	6
1956 Jan		?		Highest flood since 1938-39; higher than 1955 flood; heavy loss of merchandise	FTs		?
1964 Mar		6.72	PWD	18 ft (5.5m) in main street	FTs	Description of depth in main street sounds too high for quoted level	7
1965 Feb		*7.02?*		Highest flood on record at the time and much higher than Mar 1964 flood	FTs	Est. 0.3m higher than Mar 1964	4
1972 Oct	Bebe	*6.92?*		4½ ft (1.4m) deep at ANZ Bank; somewhat lower than 1965; 8 ft (2.4m) in town	Harris, 1972; Blong, 1994	Est. 0.1m lower than Feb 1965	5
1982 Jan?	Hettie?	5.86	PWD	4 ft (1.2m) at Nadi bus station	Blong, 1994		
1983 Mar	Oscar	6.61	PWD	12 ft (3.7m) in the market	Blong, 1994		9
1984 Mar	Cyril	5.62	PWD	1m at the Nadi bus station	Blong, 1994		
1985 Jan	Eric	4.56	PWD				
1985 Jan	Nigel	4.74	PWD				
1985 Mar	Hina	5.38	PWD	1-2m in town	Blong, 1994		
1986 Apr	Martin	6.53	PWD	1.5m at southern end of town	Blong, 1994		10
1990 Mar	Rae	5.93	PWD				
1993 Feb	Poly	7.06	PWD	1.7m in Roshni store	FTs		3
1997 Mar	Gavin	6.66	PWD				8
1999 Jan		7.25	PWD	8 inches (0.2m) higher than 1964	Interview	1964 probably confused with 1965?	2
2009 Jan		*8.05*		0.8m higher than 1999 flood at Jack's of Fiji	Interview		1

Note: italics represent calculated levels based on the described information; question marks indicate poorly constrained levels.

Source: McGree, S: 2010

Evidence of climate change in Fiji

Tropical cyclones, floods and drought are notable hazards that affect Fiji. UNISDR stated high-intensity floods would become more frequent in western (UNISDR, 2012). Extreme flood events in Nadi area like 2009, used to occur every 190 years, but by 2100 it is projected that they will occur every 25 years (BNO News, 2012). Nunn (Fiji Times, 2012) stated that, ''the flooding problem is going to worsen in Nadi over the next ten years and after that. This is because the sea level is likely to continue rising and the land on which Nadi is built is likely to continue sinking, and there is no evidence that either trend will halt or reverse.Dr Nunn's study of the sea level in the Nadi area shows that the sea is 25

centimeter higher in 2012 than it was in 1900. He added that data from the Fiji Hydrographic Office's Lautoka tide gauge shows that sea level has been rising in the Nadi area at a rate of three to four millimeter per year for several years. Thus Nadi, like atolls in Tuvalu and Kiribati, is becoming one of the most visible victims of global climate change in the Pacific islands (Fiji Times, 2012). Nunn also urged the Nadi Town council that there is a need to relocate the Nadi Town Area to elevated land, otherwise rising sea level along with sinking of the Nadi River Delta where Nadi sits on, will see the town underwater by the year 2030 (Fiji Times, 2012). Nadi is prone to tropical cyclones and people have been cultured to such natural hazards from the months of November to April. However, over the past one decade, Nadi along with other western towns of Fiji´s main island (Viti Levu) are experiencing extreme flood events.

Floods occurrence in Nadi Area

The historical flood events of year 1999 and 2009 floods were the worst ever flood experienced over the last 7 decades in Nadi Area. Year 2009 flood was the worst ever flood hit in Fiji, where 11,458 individuals were evacuated, 11 people were including two deaths from flood related landslides in Nadi Area and economic losses exceeded F$ 113 million (SOPAC, 2009). Both floods of 1999 and 2009 in Nadi area, the waters reached unprecedented levels and many residents were shocked to see rising waters in their area because their areas were never flooded. The floods of 1999, 2009, and including the recent flood of 2012 occurred were all extreme events. The 2012 flood was worse than 2009 and 1999 and even the water lever was higher at some places in Nadi Area. Places which never used to get flood experienced flooding. 2012 flood was more devastating because there were two floods within three months of the year. The recovery of the flood events for a small economy takes time and there is no time to recover when it is continuously hit by one flood after the other.

Methodologies

The primary objective of this paper is same as to the PhD thesis major research which was to analyse and to determine the sustainable livelihood issues that play an important role in achieving "food security" at all time, during and aftermath of an extreme flood event. It is still too early for me to sate in this paper whether Nadi area in Fiji experiences "transitory food insecurity risks". Transitory food insecurity means sudden drop in the ability to grow or purchase enough food to meet basic health and activity needs (FAO, 2008). However, for this paper, one would like to show that how the flood event affected individual livelihood.

The paper investigated the Nadi area with following objectives:•To identify the drivers, patterns and challenges of livelihood and food security in the western Fiji (Nadi Area). How do extreme flood events affect the household and societies? •Investigate the manner in which socio-economic and climate change related factors affect the coastal and rural livelihoods and food security as observed through food availability, stability, access to food, food utilization and demand of accessing food. Furthermore, investigate the livelihood strategies for both formal and informal employment sectors. Here, I have chosen households in three different categories for the research project: (i)Service sector: e.g. tourism, business, industrial, teachers, doctors, vendors and etc. (ii)Fishing sector and (iii)Farming sector: pastoral, sugar cane farmers, tobacco, cash crops and etc.

Finally, analyse existing measures to maintain and increase livelihood and food security. To investigate and document the vulnerability and resilience pattern of the vulnerable households in the Nadi Area-western Viti levu, Fiji to climate change impacts in the context of livelihood and food security. Thus, develop means and measures that enhance resilience. The work will also address the possible impacts of climate change on flood occurrences in western Viti Levu, Fiji. Moreover, understand people's awareness and perception of climate change and the options they have to respond to the changes and ways to cope with the trans-boundary impacts by adaptation from sea level rise, flood and

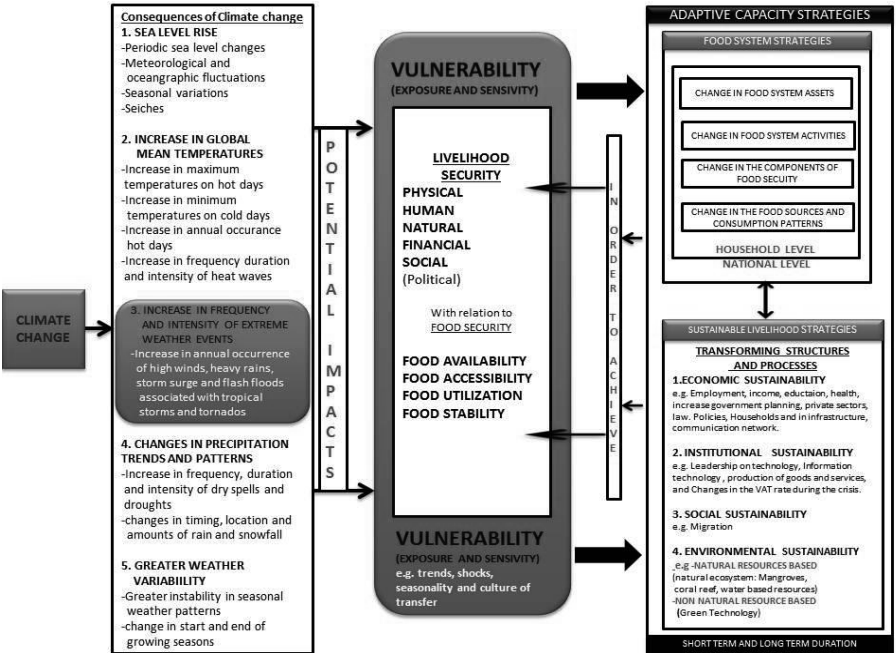
drought mitigation and response, including the benefits of floods to increasing water availability and to improving the socio-economic and ecological status of livelihood, food and water. What constitutes people's vulnerability, how can it be measured and how can its spatial distribution be analyzed and explained.

To achieve the above objectives, one constructed a conceptual framework. Sustainable livelihood approach (SLA) to analyse the impact of floods on the affected Nadi households. As such, it relies on combination of quantitative and qualitative methods to investigate and document the vulnerability and resilience pattern of the vulnerable households to climate change impacts in the context of livelihood and food security. Here one will uses questionnaire to survey households in three different sectors: (i)Service sector: e.g. tourism, business, industrial, teachers, doctors, banking and etc.; (ii)Fishing sector, and (iii)Farming sector: pastoral, sugar cane farmers, tobacco, cash crops and etc.

Main Components and characteristics of Livelihood security with relation to food security

Human	Low levels of education make villages and their inhabitants vulnerable because it limits access to information and knowledge about dangers and threats. Public health issues related to limited primary health care facilities, consistent access to safe water resources, burial traditions, solid waste management and other sanitary concerns are a case in point. Another example is the threat of HIV/AIDS and other diseases. (This includes skills, health, formal education)
Social	Low school attendance and lack of primary and secondary schools and access to information in the villages also limit the opportunities to expand the set of sustainable livelihoods open to communities. Especially the female population has a skill set that is not easily transferable to other forms of livelihood.
Financial	Monetary poverty affects virtually all inhabitants of villages. Their asset base is very narrow and their insertion in the monetary

	economy is very weak. Poverty enhances vulnerability and reduces resilience in many ways.
Natural	Its remoteness characterizes the villages. As is the case with independence and autonomy, remoteness has both positive and negative consequences in the vulnerability and resilience context. Threats and dangers from outside are mitigated by remoteness; alternative livelihood options and outside support are limited and costly. The natural habitat has its dangers for human life, such as poisoning of water and dengue fever. It also offers opportunities for sustainable livelihoods that require adequate management. Cases in point are logging and harvesting. Shifting cultivation systems and fishing, on which food security rests, are low-productivity activities that in some cases are approaching the limits of sustainability. To know how the natural asset is deterred by extreme flood event then one has to find out how people access to natural resources and secondly quality of the resources which they access.
Physical	Human settlements have been built on road sides and riverbanks, sometimes too close to high water levels. Example: The passage from Nadi temple to Korovotu Village. Infrastructure for land transport, energy and communication is virtually absent. This enhances vulnerability in situations of both extremely high and low water levels.



Prepared by Rattan, Ravindra

Field work and interpretation

The March, 2012, January, 2012, 2009 and 1999 floods in the western Viti Levu of Fiji's main island experienced the worst flood ever recorded. The floods of 2012 are centurial floods which are supposed to take place once in 100 years. The Nadi residents are shocked with the recent floods. Residents' said that they are pretty much cultured with tropical cyclones but not with the likes like of year 2012. Tropical cyclones occur between the months of November to April in the South Pacific Island Countries. Fiji Islands physiographic is unique as it is a volcanic island. Flash floods and floods during the tropical

cyclones or hurricanes is a common trend and people now have been cultured to it. However, in the recent years, floods of March 2012, January 2012, 2009 and 1999 turned the lives of many coastal families experiencing the most destructive natural hazard. The floods of March 2012, January 2012, 2009 and 1999 not only destructed the agricultural land, industrial areas, coastal resorts and cities but it also took lives. This time it was not a tropical cyclone but a tropical rainstorm which is an unusual natural hazard for South Pacific Island Countries. For Fiji Islands, the western Viti Levu was hit the most and cities and towns like Ba, Nadi, Tavua, Sigatoka, Rakiraki and Lautoka was hugely affected. The impact of the flood led to aftershock in Ba and Nadi town towns for many months. Hundreds of villages and thousands of houses along the coast and rivers and valleys were left with proper infrastructure for continuous two months.

According to one's research, I have found that 1999, 2009 and the recent floods in 2012 were very similar in nature as it was led by tropical rain storms and tropical depression. Last year Dr. Weber and I conducted a a household survey on perception and awareness during and after a flood event. Around 100 households and 50 shops were interviewed. Furthermore, I myself conducted a household survey for few days which is major survey part of my PhD thesis. Overall, few first things, I found was that for most families, the year 2009 flood was more severe and destructive and for few families it was the year 1999 which was a nightmare. Eventually, the same areas were affected and after the 2012 flood, people are now threatened to experience another extreme event.

Figure 4 shows that Nadi is blessed with wide rivers and fertile agricultural land. However, the nature has been as severe and destructive with her natural occurrence like tropical rain storms. The Nadi rivers which were once hoped for agricultural angels are not seen as life threatening even during slight rainfall. According to the 150 interviewed households and shops, it showed how continuous rainfall for days led to flood in 1999, and 2009. According to the research in Nadi area, people stated that 1999 was a single flood event but the 2009 it was different as it was there were two floods with 48 hours. This made

people confused as there were duped and flawed by the nature's behaviour. As livelihood was picking up, then two major centurial floods struck in beginning of 2012.

Many elderly people from four different villages in the Nadi area (Saunaka, Namotomoto, Nakavu and Navoci) who were interviewed for over a month stated that they have seen some changes in the weather pattern over the last one and half decades. But when asked whether they knew what climate change, greenhouse effect, ozone layer destruction and global warming are, then they had nothing to say because these scientific terms were new to them. The village's youngsters had their own ways to explain the flood events of March 2012, January 2012, 2009 and 1999. They stated that the flood was led because of the improper drainage systems, the rivers are not properly dredged and because of the constructed of new resorts near the coastal areas which once used to be covered by lush mangroves. It was very prompt for the villages to blame the construction of resorts by overseas foreign investors and hoteliers on the coast line of Nadi area and improper ways of dredging of the Nadi River. The villagers believed that all this negative factors have led to flood of the villages. Surprisingly, most people were afraid to speak against the resorts because they are employed in the resorts with good salaries. The few villages (Saunaka, Navoci, Nakavu and Namotomoto), which were my prime area of study in Nadi, receives good amount of lease money from the resorts and hotels investors. However, if I compare with Ba area which is another flood prone town in the western Viti Levu, than Ba area has nothing like Nadi area because it is more an agricultural based and many people are of lower middle class families. Even though Nadi has agricultural belt but its major development is due to tourism and most of the people are employed in resorts and hotels. Tourism industry in Nadi area has helped many poor families to raise better standard of living.

Most of the Fijian villages are built along the coast line with beautiful sandy beaches and with patches of green mangroves. Mangroves play a pivotal role as it reduces coastal erosion. According to many elders of the village, it was clear that they have seen that the mangroves are gradually decreasing. However, the villagers do not have scientific evidence

to prove that the erosion is because of sea level rise. Few elderly villagers have stated that they have seen the either the sea is coming closer to the house or the house is going towards the sea. Surely, this statement shows that the village land is eroding due to heavy rains. Few villagers said that it was all because of the weather pattern over the past two decades has changes. There has been frequent small flooding which kept on eroding the coastal land. They also blame the hotels and resorts that they are depleting the coast and this entire flood could be blocking the natural river drainage pattern. The villagers have seen huge changes in the coast marine life as it has decreased drastically. Few decades ago they were able to catch fish with arrows but now it is even more difficult to catch with nets and proper fishing gears.

Even though the elders of the villages have no literally knowledge of climate change, but they are aware that it is happening and either it is nature is punishing them for their deeds or it is led by the human activities such as construction of resorts. The shop keepers, villagers and individuals stated that over the last few years the temperature has changed a lot and the rainfall intensity and frequency has increased. The months of May and June are now much colder whereas December and January is hotter with lot of rainfalls. They gave evidence how the weather pattern has changed after the 1996-7 drought. People also gave examples of Hail in Fiji which is an uncommon occurrence though as there have been incidences in Rakiraki, Tailevu, Ba, Nadi and Vanua Levu.

The villages also explained how it was difficult to recover physically from the 1999 and 2009 flood then another two floods struck in 2012. The 1999 flood brought lot of foreign aid into the village and by the local government. However, the 2009 aid was little less and restricted compared to the 1999 aid. The villagers explained how political situation could harm then victims of the affected areas. In 1999, Fiji government was in good relationship with major international donors like Australia and New Zealand which brought lot of aid in terms of food and clothing raison, building materials and money, however, after the 2000 and 2006 coup, the relationship between Fiji Government and major aid donor became bitter which restricted full flow of financial support.

Conversely, the villages who are employed in the resorts said that the resorts supported them and their families in both 1999 and 2009 floods. The Fiji government did support in both the hazardous event but it was not enough to recover what they lost. Village chiefs stated that the village has house scheme for the last two decades to mitigate from floods occurring from tropical cyclones of heavy down pours. As the people of Fiji are aware that tropical cyclones occur between the months of November to April, and this could also lead to floods, therefore, two decades ago they had the village house scheme. The house scheme helped to build proper high raised concrete house replacing the traditional Fijian Bures (Grass thatched houses with bamboos). Unfortunately, for some high raised houses even the housing scheme could not safe them from the 2012 and 2009 floods. The flood waters rouse to maximum 13 feet and in some place the water level was more than 14 feet and more. The villagers realized that the housing scheme was to resist small flash flooding caused by tropical cyclone but not from tropical rain storms such as of March 2012, January 2012, 2009 and 1999.

As the whole town was destroyed, infrastructure (roads, water supply, electricity) were all disrupted, it became difficult for people to go to work and children to schools for at least a month. Cash crops, sugar cane plantations, coconut palms, tobacco farms were laid down under mud for many months and the towns haunted for weeks. The families had to switch from their normal diet to canned food and mineral supplied by the military. The shop owners stated that the damages occurred to them was in millions. Few shops had to close down forever because were no insurance on natural hazards.

Migration

The youngsters of the village prefer to move to a new location but they at the same time understand that it is not easy to move with government's financial support. The village's elders remained steady with answers that they would not leave their forefathers

land and are not going to relocate. The villagers do believe that it is necessary to protect themselves and their children from the environmental change; however, this would be costly. The flood left the victims in trauma as most of them were destroyed in the March 2012, January 2012, 2009 and 1999 flood events. Migration itself is so expensive. The villagers could only relocate to a safer place unless the government provides them housing. Majority of the families took more than a year to recover from the flood as it gave damages to the house if compared to tropical cyclones which would be recovered much quickly. Damages caused by the flood takes much greater time compared to the damaged caused by the flood as all the infrastructure is disrupted and damaged. Few people lost their jobs like people employed in the tobacco farms as the farm itself went on loss, market vendors who sold vegetables, taxi drivers as people are not in financial status to use taxis, and doctors migrated or lost their private clinic as more people preferred government hospitals. The March 2012, January 2012, 2009 and 1999 were so drastic because according to many people it was a usual extreme event and it hit during the wrong economic period, which is recovery from recession. The world was going global financial crisis and recession, the Fiji government itself has political instability, and at the same the fuel price has risen up. All this cumulated into a destructive event.

Explaining the decline in sustainable livelihood and food system

The purpose of this case study is to explore livelihood trajectories in the context of manmade and natural disasters in Nadi area. This research is based on in depth qualitative analysis of 150 households and shops to trace out the changes in household welfare and livelihood security by severely destructive floods led by tropical depression and tropical rainstorm. The case evidence shows that majority of the households were facing declining livelihood security. Out of 100 household and 50 shops interviewed, only the chiefly households were found to cope with the crises while the remaining was declining. Nearly all

the 50 shops interviewed suffered huge loss from minimum 10 thousand dollars to millions dollars loss where the insurance company did not cover the loss.

The factors which enable coping households to maintain their livelihood security in the year 1999 floods are international remittances, wealth, more male worker, government jobs and political connections. The factors which lead to the decline of majority of case households includes low or lack of livelihood diversification, human losses and injuries/illness especially the male worker, loss or sale of livestock. However this was not the same in 2009 flood as the helping aid declined because of Fiji´s political reputation with the neighbouring donor countries like Australia and New Zealand and even with other commonwealth countries. Thence, the 2006 took the membership of Fiji as a commonwealth country and with this United Nation also declined the program and project aid. The most prominent responses induced by both the crises were internal as well as external migration for work. The medium and poor households were further pushed into more vulnerable conditions. The study households received relief assistances from government, NGO, and informal sources but at different extent. However, the large number of households with declining livelihoods security indicates the inadequacy or limitations of assistance. Informal support system was weakened by the crises due to the reduced capacity of the people to extend support to each other and the people were relying to get support from their relatives, friends and non-relatives in other parts of the country.

Through the case study, it is also revealed that food insecurity issues are not only a rural phenomenon but 'dwelling' within urban fringes as well of Nadi town after a decline in the cash crops, vegetables and even supply of chicken and fish reduced vastly. Thence, this led to increase in the prices of the basic goods. Here poor suffered as more but they were able to recover much quicker but the upper middle class who houses were not insured suffered a lot.

Therefore, policy-makers and civil society need to address the reality of the problem to potentially alleviate the situation; it is now a trend for the last ten years to see frequent

severe rainstorms which leads to the flooding of the low lying coastal villages, settlements, towns, industrial areas and farming areas.

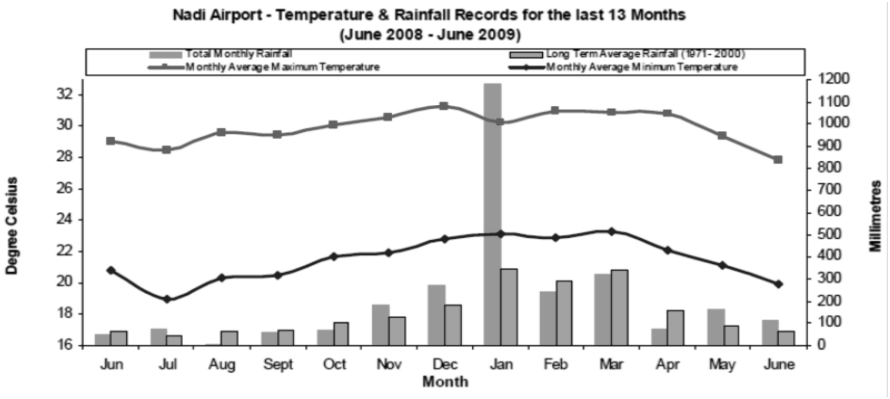


Figure 3: Temperature and rainfall of 2008 and 2009The graphs shows that Nadi area experienced more than average rainfall in the month of January which led to devastating extreme flood of year 2009. Five days of continuous rain in 50 years. (Source: McGree, S; 2010)

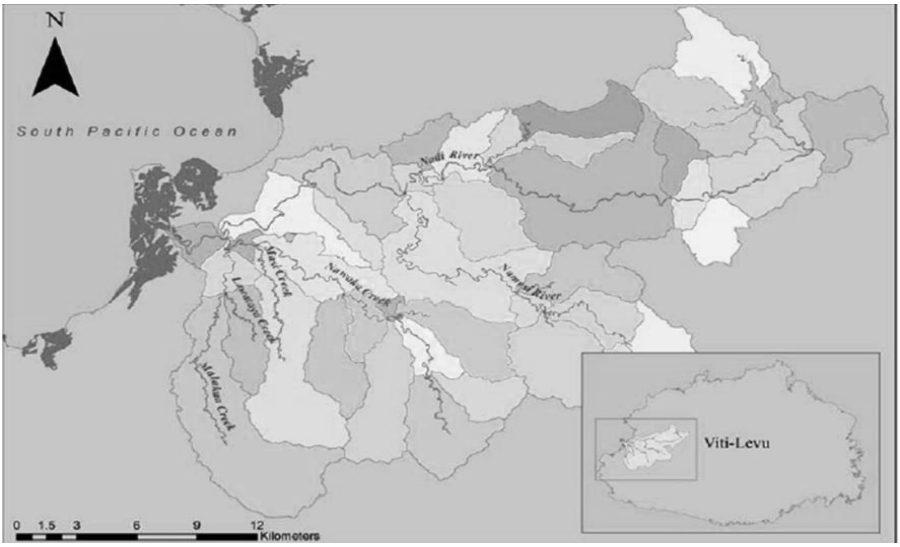


Figure 4 Nadi River Basin and Catchment (Source: Paquette, J: 2011)

The primary field work stated that the Nadi Area experienced continuous and heavy rain from 8 to 15 January 2009 and included periods of exceptional intensity. Nearly the same households were flooded as in 1999 but when compared; the year 2009 flooding affected more coastal houses, shops and industries. People also remembered and stated that the extent and depth of flooding in Nadi was the worst from 1999 flood.

The table 1 also shows that the flood of year 2009 was severe ever flood recorded since 1931. However, there were no proper records made in 1931 which could show that it was even worse than 20012 or 2009. One reason why 2012 flood is recorded as the worst flood is because more people are now residing along the Nadi river catchment. The population is continuously rising because Nadi is the gateway for tourism. Most of the people are employed in resorts/ hotels; in the British Tobacco factory; Nadi International and most of the people are either sugar cane or cash crop farmers. Recent flooding had directly or indirectly affected 150,000 people (roughly one-sixth of the population) through disruption of communications and access to food and clean water. Affected areas suffered damage to roads, schools, medical facilities, water and sanitation facilities, and crops. Commercial enterprises were particularly badly hit in Nadi. Similarly, damage to sugarcane, which is also one of the largest contributors to the GDP, reduced the quantity of sugar for export, further constraining the economy. People also stated that the 1999 flooding took less time to recover then 2009 flooding because there was less foreign aid in terms of money, food and building materials from neighboring countries like Australia and New Zealand. People stated that 2006 military coup in Fiji was the main reason for the decline on foreign aid. In both the floods, livestock's, poultry farms and vegetable farms were damaged. Thence, prices of vegetables and the meat increased and it made people to rely heavily on government rations.

Some people also lost their jobs forever because the places they used to work were completely destroyed. Few shopkeepers lost entirely everything such as jewelry shops, restaurants and book shops. Conversely, few shops and people benefited after the flood such as the repairing cars shops, cleaner, plumbers and carpenters. The village headmen

of some villages said that some people prefer to shift to elevated lands but they are restricted from financial constraints.

Conclusion

The case study shows that majority of the households were facing declining livelihood security from the year March 2012, January 2012, 2009 and 1999. Many worker lost jobs because of the shutting down of foreign invested resorts and hotels; international aid reduced because of the 2006 military coup and farmers lives have more miserable because farms are no longer suitable for farming. Nadi´s sustainable livelihood has been economically challenged because there are financial constraints to cope up with one after the other extreme flood events both by the Fiji government and International aid. “To move or not to move”, that is the question within the minds of the people of Nadi Area because the research shows that there is a need to relocate the Nadi town area to elevated land. As I have mentioned at the beginning of this paper the the analysis and interpretation are based on auxiliary data and for few days of field work.

Photo 1: Nadi Residential Area: 2012 flood

Photo 2: Fijian Village in Nadi: 2009 flood

Photo 3: Nadi Town: 1999 flood

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